PATENT SPECIFICATION (11) 1 433 926

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(21) Application No. 21858/73 (22) Filed 8 May 1973
(31) Convention Application No. 7 216 819
(32) Filed 10 May 1972 in
(33) France (FR)
(44) Complete Specification published 28 April 1976
(51) INT CL² C21C 1/10//B22D 27/20, 1/00
(52) Index at acceptance
C7D 3G6 3G7A 3G7J
B3F 11P 13A3 13A6D1C 13A6D3B

(19)

(54) IMPROVEMENTS IN OR RELATING TO A COMPOSITE IRON-INOCULATING SUBSTANCE

(71) We, PONT-A-MOUSSON S.A., a French Body Corporate, of Avenue Camille Cavallier, 54 Pont-A-Mousson, France, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:—

The present invention relates to a composite substance for inoculating iron.

In the manufacture of cast iron parts it is known to inoculate the iron, for example with ferro-silicon for spheroidal graphite iron, so as to promote in this case the graphitization in the course of the solidification of the metal. In order to ensure that this inoculation is carried out correctly, it is also known to effect the inoculation a very short period of time before the solidification of the metal and, for this purpose, the liquid iron is for example made to pass over inoculating bodies placed in a chamber of the mould and consisting of massive pieces of inoculating agent alone, or an inoculating substance dispersed in a wax matrix.

Now, the use of massive pieces of inoculating agent has the drawback that the inoculation is little effective in particular owing to the fact that the dissolution of the pieces of inoculating agent is irregular, which results in a supply of agent which is not constant throughout the filling of the mould so that the cast part is not inoculated in a uniform manner. Further, the use of an inoculating substance dispersed in a wax matrix has the drawback that the cooled cast part has a high number of pinholes or pits in the surface or in the vicinity of the latter.

An object of the present invention is to remedy these drawbacks and provide a composition for inoculating iron comprising an inoculating agent in powder form aggregated by a binder constituted by anhydrous sodium chloride.

With this substance, it is possible to obtain throughout the pouring of the liquid iron a good and regular inoculation of the iron and the cast parts are practically without pits or pinholes.

Further features and advantages of the invention will be apparent from the ensuing description, given merely by way of example, with reference to the accompanying drawing, in which:

Fig. 1 is a diagrammatic view of a mould for showing the advantageous properties of an inoculating substance according to the invention, and

Fig. 2 is a comparative diagram of the percentages of inoculation obtained in identical cast parts which were inoculated with a substance according to the invention and with two known substances.

According to the invention, the composite inoculating substance is obtained by mixing in the powdered state ferrosilicon and anhydrous sodium chloride.

A particularly advantageous manner of proceeding comprises putting this inoculating substance in the form of pellets obtained by compressing with a press a mixture comprising 40—80% by weight of powdered ferro-silicon having a grain size of 60—200 microns, the remainder being anhydrous sodium chloride in powdered form having the same grain size as the ferro-silicon.

As shown in Fig. 1, a preferred method of inoculating iron in a mould by means of the considered substance comprises placing said pellets 1 of inoculating substance on a filter 2 placed in the pouring system of the mould 3 and more precisely in the joint plane of this mould in a chamber 4 located at the base of the iron pouring aperture 5. When poured through this aperture 5 and through the chamber 4, the liquid iron comes in contact with the pellets 1 of inoculating substance and dissolves them before entering by way of the filter 2 the cavities of the mould 3 for the part or parts to be cast.

The fact of putting the composite substance in the form of pre-formed pellets offers the advantage that it is possible to regulate the inoculating degree in accordance with the

amount of iron to be treated by employing an appropriate number of pellets or by varying the mass of the pellets.

Further, the composite inoculating substance dissolves regularly in iron and the inoculation of the latter is constant throughout the pouring and this iron is therefore inoculated in a regular manner. This inoculation is also reproducible without variation in the degree of inoculation. Moreover, the part thus cast has very few pits or pinholes.

The pellets of composite substance obtained by compression have a good mechanical behaviour so that it is easy to handle them without breaking them.

By way of example, three iron castings A, B and C were made an identical moulds by using as inoculating agents:

— for the casting A, a piece of ferro-silicon;

— for the casting B, powdered ferro-silicon dispersed in a wax matrix and;

— for the casting C, the aforementioned composite substance.

The castings were made in moulds of the type shown in Fig. 1 which comprises five identical moulding cavities having wedge shapes E^1, E^2, E^3, E^4 and E^5 disposed in a row in line with the pouring system 4—5. In order to examine the degree of inoculation as a function of the amount of poured iron which passes over the inoculating substance, and in order to control the order of filling of the cavities, the mould 3 was inclined by placing it on a block 6 so that the cavity E^1 is filled before the cavity E^2, the cavity E^2 before the cavity E^3 and so on.

There was measured in respect of each casting A, B and C the percentage of silicon which had passed, after inoculation, into the iron of each wedge cast. These percentages are shown in Fig. 2 as ordinates for five abscissae which are evenly spaced apart and represent the five successive moulding cavities. This representation as abscissae may be likened to the path that the iron travels through from the inoculating pellets to each of the cavities, or to the instants at which the iron reaches each mould cavity after the start of the pouring.

The values obtained are the following expressed, as percentage of silicon:

	E^1	E^2	E^3	E^4	E^5
A	0.12	0.14	0.42	0.70	0.27
B	0.15	0.28	0.23	0.17	0.11
C	0.22	0.22	0.23	0.23	0.23

In interconnecting the points obtained it is seen that on the full line, which represents the inoculation by means of the composite substance according to the invention (casting C), this inoculation is practically constant irrespective of the mould cavity and therefore irrespective of the duration of the pouring, whereas in respect of an inoculating piece (casting A, dotted line), the inoculation takes a long time to start and reaches in respect of the mould cavity E^4 a much higher inoculation degree than in the other cavities. In respect of the inoculation with a mixture of ferro-silicon and wax (casting B, dot-dash line), the inoculation also takes a long time to start but evens out while diminishing at the end of the pour. This experiment shows the regularity of the inoculation achieved with the substance according to the invention.

Two other sets of castings were made in a mould of the same type as that shown in Fig. 1, but not wedge-shaped castings but plane castings. They show that the castings obtained with the mixture of ferro-silicon and wax has many pits or pinholes on the surface, namely around ten, before machining the surface and several tens after machining, whereas the same casting cast with use of the substance according to the invention gave a normal number of pits or pinholes, namely less than five both before and after machining.

By way of a modification, instead of placing the pellets of inoculating substance in a chamber of the pouring system, it is possible to make the conduit defining the pouring passage of the mould itself or a perforated casting core of the substance according to the invention.

WHAT WE CLAIM IS:—

1. A composition for inoculating iron comprising a powdered inoculating agent aggregated by a binder constituted by anhydrous sodium chloride.

2. A substance as claimed in claim 1, wherein the inoculating agent is ferro-silicon.

3. A substance as claimed in claim 2, wherein the grain size of the ferro-silicon is 60—200 microns.

4. A substance as claimed in claim 2 or 3,

wherein the substance comprises 40—80% by weight of ferro-silicon and the remainder anhydrous sodium chloride.

5. A substance as claimed in any one of the preceding claims, in the form of pellets.

6. A substance as claimed in any one of the preceding claims, in the form of a perforated pouring core.

7. A substance as claimed in any one of the claims 1—5, in the form of a mould pouring passage.

8. A composite iron inoculating substance as claimed in claim 1, substantially as hereinbefore described.

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Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1976.
Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

1433926 COMPLETE SPECIFICATION
1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

FIG. 1

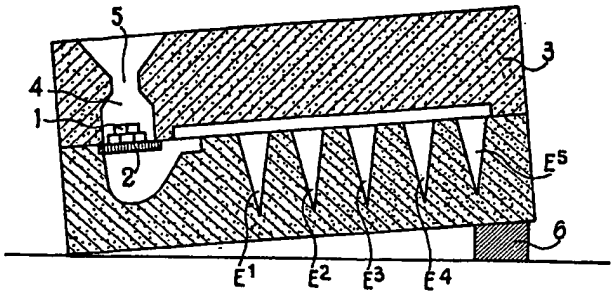

FIG. 2